ing permission to study Kennewick Man, a 9000-year-old skeleton found in 1996 in Washington state.

Anthropologist Alan Goodman of Hampshire College in Amherst, Massachusetts, agrees with Gravlee that it's risky to rely on cranial data to identify the origins of long-gone populations. "The evidence does suggest that crania do change," he says. "If you want to apply [craniometrics] to Kennewick Man and you know there's instability over a 10-year period, what can you expect over a 9000-year period?" Sparks responds that the instability is largely owing to genetic changes, not plasticity, and that a common ancestor can still be inferred by comparing an ancient skull with a modern one that resembles it.

Heavy media coverage of the Sparks paper prompted the American Anthropological Association to post the Gravlee paper, scheduled for March 2003, on its Web site. The two authors will go head-to-head again in June when the *American Anthropologist* revisits the issue. **–CONSTANCE HOLDEN**

EVOLUTIONARY BIOLOGY

Placentas May Nourish Complexity Studies

It's one of the oldest riddles in evolutionary biology: How does natural selection gradually create an eye, or any complex organ for that matter? The puzzle troubled Charles Darwin, who nevertheless gamely nailed together a ladder of how it might have happened—from photoreceptor cells to highly refined orbits—by drawing examples from living organisms such as mollusks and arthropods. But holes in this progression have persistently bothered evolutionary biologists and left openings that creationists have been only too happy to exploit. Now a team of researchers presents a model system for studying the evolution of complex organs—in this case, the placenta—that Darwin could only dream about.

"Darwin had to use organisms from different classes," explains David Reznick, an evolutionary biologist at the University of California (UC), Riverside, "because there isn't a living group of related organisms that have all the steps for making an eye." And there's no way to put Darwin's solution on firm scientific footing through experiments, Reznick notes, because the organisms in his model are so distantly related to one another.

On page 1018, Reznick and his colleagues propose that guppylike fish in the genus *Poeciliopsis* can solve such problems for the placenta and, by extension, other complex organs. Placentas have evolved independently three times in closely related *Poeciliopsis* species, they report. Other species in the genus lack placentas, and some have partial maternal provisioning by means of tissues that might be precursors of placentas. Thus the fish present the full trajectory of steps involved in the evolution of this organ, Reznick says, allowing researchers to "see what's been added, or what has changed, and eventually identify the genes associated with the evolution of each trait." Adds Stephen Stearns, an evolutionary biologist at Yale University, "Since these placentas have evolved multiple times, we now have a promising model that can be explored and manipulated in the lab—something we've needed for a long time."

Placentas serve as a decent stand-in for eyes and other complex organs such as the heart or kidney whose histories evolutionary biologists have never been able to trace, Reznick and colleagues argue. By definition, complex organs are composites of independently derived features; for instance, the human eye focuses light and also perceives color. In the case of the placenta, the organ provides nutrients for the fetus while simultaneously managing waste products and regulating gas exchanges. Evidence of the intermediate steps for acquiring such organs is missing from the fossil record, enabling creationists to claim they were "created" de novo.

Reznick began to suspect that the poeciliid fish and their placentas could serve as a model for addressing thorny evolutionary questions 15 years ago, while writing a review of live-bearing fish. Earlier this year, one of his co-authors, Mariana Mateos of the Monterey Bay Aquarium Research Institute in Moss Landing, California, developed a phylogenetic tree for *Poeciliopsis*. By combining the tree with Reznick's earlier research and phylogenetic analysis by UC Riverside's Mark Springer, the team now demonstrates that there were three independent origins for placentas in six species of *Poeciliopsis*.

CREDIT: D. REZNICK *ET AL.*

Recurring theme. Placentas (left) that provision embryos (right) have evolved three times in *Poeciliopsis* fish.

The team also estimates the amount of time required for the separation of the poeciliid species. They based their clock on the rate of mutations in the fishes' mitochondrial DNA and incorporated dates of geological events that probably led the species to diverge. The shortest time interval between a poeciliid species with a placenta and its last common ancestor without one was 750,000 years—a period in keeping with the 400,000 years other researchers have calculated for the evolution of the eye. Despite this relatively short period, "it's not a problem for evolution to create this kind of complexity," says Stearns.

Other researchers, such as Günter Wagner, an evolutionary biologist who is also at Yale, caution that Reznick has yet to demonstrate convincingly that the poeciliids' placenta is a complex organ. But even with this caveat, Wagner concedes that the poeciliid model offers evolutionary biologists a rare opportunity: "We should welcome any model, and especially one like this that has several related species with all the variations in the evolution of this trait."

Reznick admits that the poeciliid placenta might not be as sophisticated as the mammalian placenta. But like the evolution of the eye, the evolution of the mammalian placenta is lost in history. "We can't ask how this kind of adaptation evolved with mammals because it only happened once over 100 million years ago," he says. The answer might come instead from small, guppylike fish. **–VIRGINIA MORELL**

PFIESTERIA DEBATE

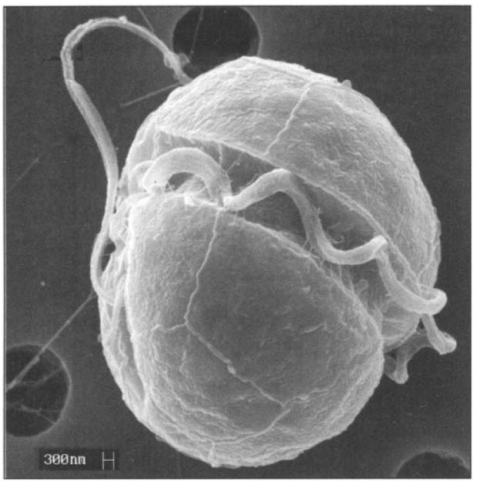
Is Sugary Toxin the Smoking Gun?

A team of researchers claims to have found more support for the controversial assertion that a toxic microbe called *Pfiesteria* is responsible for massive fish die-offs along the eastern United States. But the new studies, which include the first rough sketch of the toxin, have failed to convince skeptics.

For 10 years, aquatic ecologist JoAnn Burkholder of North Carolina State University in Raleigh has argued that a potent neurotoxin from the dinoflagellate *Pfiesteria* has killed more than a billion fish in East Coast estuaries and sickened lab workers and fishers. However, the toxin has not been identified. This past summer, doubts escalated when researchers at the Virginia Institute of Marine Science (VIMS) in Gloucester Point and other universities reported in two top journals that

they could not find a toxin, and that *Pfiesteria* can kill larval fish by feeding on them (*Science*, 11 October, p. 346).

Last week, at the 10th International Conference on Harmful Algae in St. Petersburg, Florida, Burkholder said that her critics had not established the right conditions for making *Pfiesteria* produce toxin. Her lab coaxed the strain of *Pfiesteria shumwayae* used in the VIMS experiments to kill juvenile tilapia in less than 4 hours, which meets her criteria for toxicity. Collaborating chemist Peter Mueller of the National Oceanic and Atmospheric Administration in Charleston, South Carolina, described a toxic chemical isolated from Burkholder's fish-killing *Pfiesteria* strains. Burkholder says the NOAA lab also detected this chemical in water and cells from the VIMS strain. It appears to be a glycoside, a molecule that's half sugar, half some other chemical group that hasn't been identified.



Toxic or just hungry? Scientists disagree on how deadly a sugarlike molecule reportedly made by the *Pfiesteria* microbe (above) is to fish.

Other algal toxin researchers remain skeptical. Wayne Carmichael of Wright State University in Dayton, Ohio, says that, although he knows of one other algal toxin that's a glycoside, this kind is unlikely to cause the neurotoxic effects reported in fish and humans. "It would not explain the range" of observations, he says. VIMS fish pathologist Wolfgang Vogelbein points out that nobody has yet shown that this purified toxin produces the lesions he sees on fish physically attacked by *Pfiesteria*.

Burkholder's critics want the chance to test her toxic strains. Burkholder, who has long been criticized for not sharing her strains, says that "there were discussions" at the meeting of organizing blind testing of her cultures by other labs, but it's "still in the planning stages." The key issue, she says, is for other scientists to follow her protocols.

–JOCELYN KAISER

INTERNATIONAL COOPERATION

NATO Ordered to Cut Science Program

CAMBRIDGE, U.K.—The idea was to celebrate science at the North Atlantic Treaty Organization (NATO). But 2 days before last week's first-ever "Grand Gathering" in Brussels of researchers and others connected with NATO's science program, the alliance's political overseers slashed the program's $24 million budget by 13%. The fete quickly turned into a self-examination of a program that has struggled to find a suitable mission to replace its former role in helping Western nations stand up to Soviet hegemony. It also spawned a behind-the-scenes effort to reverse the cuts.

The science program supports research grants, fellowships, and workshops for scientists from NATO's 19 member countries and 34 nations in Eastern Europe, Central Asia, and North Africa. Its budget—a slice of NATO's civilian budget, which itself is only 14% of the alliance's roughly $850 million war chest—"is peanuts," admits Jean Fournet, NATO's assistant secretary general for scientific affairs. But after a decade of budgetary stagnation, "this is the first year we've had a substantial cut," says University of Oslo mathematician Jens Erik Fenstad, a 10-year veteran of the science committee that helps set program policy. "NATO has to decide whether it wants a science program or not," adds committee member Charles Buys, a medical geneticist at the University of Groningen, the Netherlands.

Science has never been a high priority for NATO's military masters. The program survived a temporary Canadian withdrawal in 1997, thanks in part to a report by a blue-ribbon panel that urged NATO to expand its scientific efforts in Eastern Europe (*Science*, 31 October 1997, p. 795). But the program is under renewed scrutiny along with NATO itself, which next month prepares to welcome up to nine new members.

In recent years, the science program has won praise for funding security projects in such flash points as the Caucasus and Central Asia and for its innovative "Virtual Silk Highway" Internet project that links scientists from Vancouver to Vladivostok. The program responded to the 11 September terror attacks by bolstering its portfolio of nonclassified research and workshops on nonproliferation and fighting terrorism. And its robust ties with Russian scientists have aided that country's integration into the NATO family.

But just as the science program appeared to be adapting to the changing geopolitical landscape, the overlords of the alliance's civilian affairs—NATO ambassadors from each member country—delivered a harsh setback by lopping off a big chunk of its budget. Although their 22 October deliberations were secret, a few of the smaller member nations have been demanding cuts in NATO's civil budget, says Thordur Jonsson, Iceland's representative to NATO's science committee. The science program, the largest civil line item apart from salaries, proved a tempting target.

When word filtered out the next day, representatives on the science committee from 18 of the 19 member states immediately signed a statement denouncing the cuts. The lone holdout was the U.S. representative, physicist Vic Teplitz of Southern Methodist University in Dallas, Texas. "I didn't particularly want to sign it," says Teplitz, adding that he favors "a more thoughtful reaction." The letter was expected to go this week to NATO's secretary general, George Robertson, who according to committee members can weigh in before the decision is finalized.

Anticipating bad news, Fournet's team had already decided to revamp the popular fellowships program, which places a few hundred scientists a year from Eastern Europe and other disadvantaged regions in Western labs. It hopes to save money by awarding salaries and equipment grants to about 1000 scientific émigrés a year who are willing to return East for at least 3 years. "We'll do more with less" by taking advantage of the large differential in salaries, says Fournet. But Jonsson and other committee

Propped up. A NATO science project on seismic risk is studying the aftermath of a 1988 quake that devastated Gyumri, Armenia's second largest city.

CREDITS: (TOP TO BOTTOM) VIRGINIA INSTITUTE OF MARINE SCIENCE; MUTSUMI STONE